

Course guide 340077 - ELRM-D4O37 - Elasticity and Strength of Materials

	Last modified: 06/02/2025
Unit in charge:	Vilanova i la Geltrú School of Engineering
Teaching unit:	737 - RMEE - Department of Strength of Materials and Structural Engineering.
Degree:	BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Compulsory subject).
Academic year: 2024	ECTS Credits: 6.0 Languages: Catalan

LECTURER		
Coordinating lecturer:	ELSA PÉREZ GUINDAL	
Others:	Perez Guindal, Elsa Garcia Vilana, Silvia Musté Rodríguez Marta (Lab) JLuis Junquera (Lab)	

PRIOR SKILLS

Knowledge of mechanical physics, especially static equilibrium of mechanical sets.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

2. G1. Ability to solve arithmetic problems related to engineering. Aptitude to apply knowledge concerning: linear algebra, geometry, differential geometry, differential and integral calculus, numerical methods, stadistics technology.

3. D1. Knowledge of fundamental principals of mechanics of solids rigids and its application of resolving problems concerning engineering (CINEMATICA, statics, dynamics)

- 4. D5. Ability to carry out and analyze experiments of mechanism and resistant elements.
- 5. D4. Knowledge of material elasticity and resistance and its application to resolve engineering problems.
- 6. D8. Ability to dimension and to select machines and structure elements.

Transversal:

1. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

The hours of guided learning will be distributed in theoretical classes with the large group in which the concepts of the subject and direct applications will be taught, as well as the problems of the subject; and in the small group, 5 laboratory practices were carried out individually, constituting a test in which the theoretical knowledge acquired is evaluated, as well as, the results obtained in the experimentation carried out.

After each session, tasks are proposed to be worked out of the classroom individually or in the group to reinforce knowledge. All the necessary material for the subject is provided through Athena, where you will find theoretical materials, practical problems, ordered by course topics, and recommended bibliography, and thus promote self-learning through readings and problem solving.



LEARNING OBJECTIVES OF THE SUBJECT

Set the general equations that govern the phenomena that occur inside an elastic body when it is subjected to external actions, to determine the strain and strenght state of a body (elasticity). Learn to find the critical differential points of real pieces where the stress and strain are maximum and apply the equations of the strenght of materials to calculate such stresses, and use the elasticity equations to find the 2D or 3D state of tensions of those differential points in the space. All this is applied to the learning of dimensioning and design of mechanical elements from the point of view of the strenght of the materials (resistant capacity, deformation, rigidity, etc. depending on the materials applied).

STUDY LOAD

Туре	Hours	Percentage
Self study	90,0	60.00
Hours large group	45,0	30.00
Hours small group	15,0	10.00

Total learning time: 150 h

CONTENTS

title english

Description: content english

Full-or-part-time: 1h Theory classes: 1h

(ENG) - ELASTICITAT: Vector Tensió i estat tensional pla.

Description: Elasticity Theory and stress concept

Full-or-part-time: 4h Theory classes: 2h Laboratory classes: 2h

(ENG) - ELASTICITAT: Estat de deformacions en el sòlid elàstic

Description: Deformation theory and deformation matrix

Full-or-part-time: 1h Theory classes: 1h



(ENG) - ELASTICITAT: Relacions entre tensions i deformacions

Description:

Hooke law, Poisson coeficient and Lame equations

Full-or-part-time: 3h Theory classes: 1h Laboratory classes: 2h

(ENG) - RESISTÈNCIA DE MATERIALS: Tracció i compressió

Description: Stress and strain cocept failure criteria safety coefficient

Full-or-part-time: 4h 30m Theory classes: 2h 30m Self study : 2h

(ENG) - RESISTÈNCIA DE MATERIALS: Torsió

Description:

Pure shear state and its Mohr circle. Shaft deformations due to torsion, angular and torsion angle. Equation of elastic torsion and application to axles

Full-or-part-time: 2h 30m

Theory classes: 2h 30m

(ENG) - RESISTÈNCIA DE MATERIALS: Forces tallants

Description:

Shear forces in engineering elements and angular deformations. Design and Size of pins, welding beads, etc.

Full-or-part-time: 1h 30m Theory classes: 1h 30m

(ENG) - RESISTÈNCIA DE MATERIALS: Flexió

Description: Navier law and beam design using tabulated profiles

Full-or-part-time: 4h 30m Theory classes: 2h 30m Laboratory classes: 2h



(ENG) - RESISTÈNCIA DE MATERIALS: Sol·licitacions combinades

Description:

- analysis of combined efforts in an engineering element
- analysis of the tensions in its critical section and search for the main tensions

Full-or-part-time: 4h

Theory classes: 4h

GRADING SYSTEM

EXAMINATION RULES.

Electronic devices, such as mobile phones, cannot be carried. During the tests, the documentation previously established by the teacher in class and prepared by the student himself individually and in handwriting will be able to be consulted.

BIBLIOGRAPHY

Basic:

- Beer, Ferdinand Pierre; Johnston, E. Russell; DeWolf, John; Mazurek, David F. Mecánica de materiales [on line]. 7a ed. México: Mc-Graw-Hill Education, 2017 [Consultation: 19/02/2024]. Available on: <u>https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB BooksVis?cod primaria=1000187&codigo libro=8071</u>. ISBN 9781456260866.

Complementary:

- Gere, James M; Bugeda, G; Timoshenko, Stephen. Resistencia de materiales . 5a ed. Madrid [etc.] : International Thomson Editores, cop. 2002. ISBN 8497320654.

RESOURCES

Other resources:

Teaching material (theory and exercices) will be hang on the Atenea during de course.